



Power MOSFET

Features

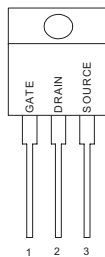
- Higher Current Rating
- Lower $R_{DS(on)}$
- Lower Capacitances
- Lower Total Gate Charge
- Avalanche Energy Specified

General Description

This advanced high voltage MOSFET is designed to withstand high energy in the avalanche mode and switch efficiently. This new high energy device also offers a drain-to-source diode with fast recovery time. Designed for high voltage, high speed switching applications such as power supplies, converters, power motor controls and bridge circuits.

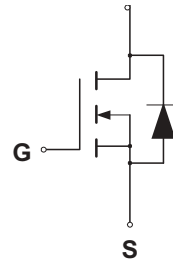
Pin Configuration

TO-220/ITO-220
Top View



Symbol

N-Channel MOSFET



Absolute Maximum Ratings

Rating	Symbol	Value	Unit
Drain Current – Continuous	I_D	4.0	A
– Pulsed	I_{DM}	14	
Gate-to-Source Voltage – Continuous	V_{GS}	± 20	V
– Non-repetitive	V_{GSM}	± 40	V
Total Power Dissipation	P_D		W
TO-220		96	
ITO-220		38	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^{\circ}\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – $T_J = 25^{\circ}\text{C}$ ($V_{DD} = 100\text{V}, V_{GS} = 10\text{V}, I_L = 4\text{A}, L = 10\text{mH}, R_G = 25^{\circ}\text{C}$)	E_{AS}	80	mJ
Thermal Resistance – Junction to Case	θ_{JC}	1.30	$^{\circ}\text{C}/\text{W}$
– Junction to Ambient	θ_{JA}	100	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	$^{\circ}\text{C}$



Ordering Information

Part Number	Package
CTM04N60N220	TO-220
CTM04N60N220FP	ITO-220

Electrical Characteristics

Unless otherwise specified, T_J = 25°C.

Characteristic	Symbol	CTM04N60			Units	
		Min	Typ	Max		
Drain-Source Breakdown Voltage (V _{GS} = 0 V, I _D = 250 μA)	V _{(BR)DSS}	600			V	
Drain-Source Leakage Current (V _{DS} = 600 V, V _{GS} = 0 V)	I _{DSS}			0.1	mA	
Gate-Source Leakage Current-Forward (V _{GS} = 20 V, V _{DS} = 0 V)	I _{GSSF}			100	nA	
Gate-Source Leakage Current-Reverse (V _{GS} = -20 V, V _{DS} = 0 V)	I _{GSSR}			-100	nA	
Gate Threshold Voltage (V _{DS} = V _{GS} , I _D = 250 μA)	V _{GS(th)}	2.0		4.0	V	
Static Drain-Source On-Resistance (V _{GS} = 10 V, I _D = 2.0 A) *	R _{DS(on)}			2.4	Ω	
Forward Transconductance (V _{DS} = 50 V, I _D = 2.0 A) *	g _{FS}	2.2			S	
Input Capacitance	C _{iss}	(V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz)	540	760	pF	
Output Capacitance			C _{oss}	125	180	pF
Reverse Transfer Capacitance			C _{rss}	8.0	20	pF
Turn-On Delay Time	t _{d(on)}	(V _{DD} = 300 V, I _D = 4.0 A, V _{GS} = 10 V, R _G = 9.1 Ω) *	12	20	ns	
Rise Time	t _r		7.0	10	ns	
Turn-Off Delay Time	t _{d(off)}		19	40	ns	
Fall Time	t _f		10	20	ns	
Total Gate Charge	Q _g	(V _{DS} = 480 V, I _D = 4.0 A, V _{GS} = 10 V) *	5.0	10	nC	
Gate-Source Charge	Q _{gs}		2.7		nC	
Gate-Drain Charge	Q _{gd}		2.0		nC	
Internal Drain Inductance (Measured from the drain lead 0.25" from package to center of die)	L _D		4.5		nH	
Internal Drain Inductance (Measured from the source lead 0.25" from package to source bond pad)	L _S		7.5		nH	
SOURCE-DRAIN DIODE CHARACTERISTICS						
Forward On-Voltage	V _{SD}	(I _S = 4.0 A, V _{GS} = 0V, d _{IS} /d _t = 100A/μs)	0.86	1.0	V	
Forward Turn-On Time	t _{on}		**		ns	
Reverse Recovery Time	t _{rr}		655		ns	

* Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%

** Negligible, Dominated by circuit inductance



Typical Electrical Characteristics

Figure 1. Typical Output Characteristics, $T_c=25^\circ\text{C}$

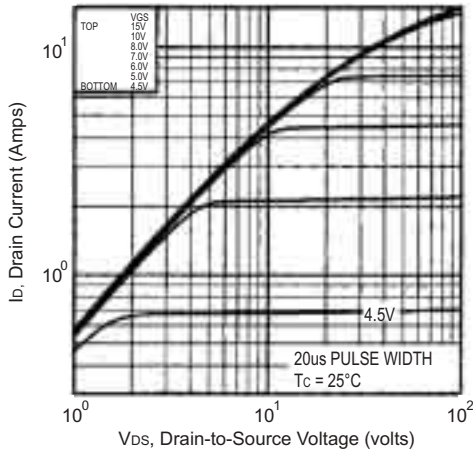


Figure 2. Typical Output Characteristics, $T_c=150^\circ\text{C}$

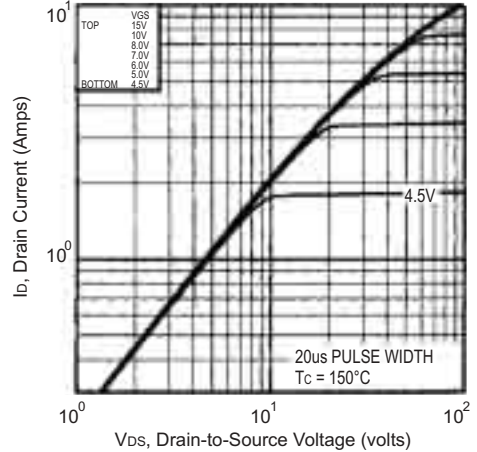


Figure 3. Typical Transfer Characteristics

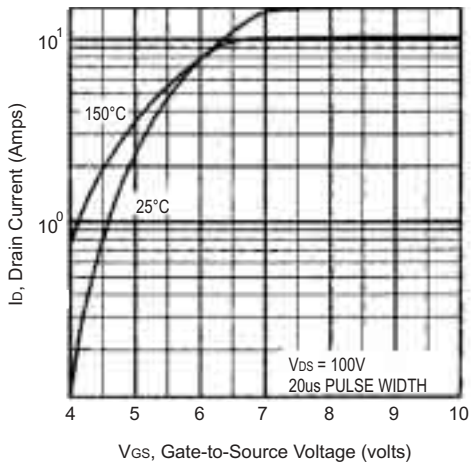


Figure 4. Normalized On-Resistance vs. Temperature

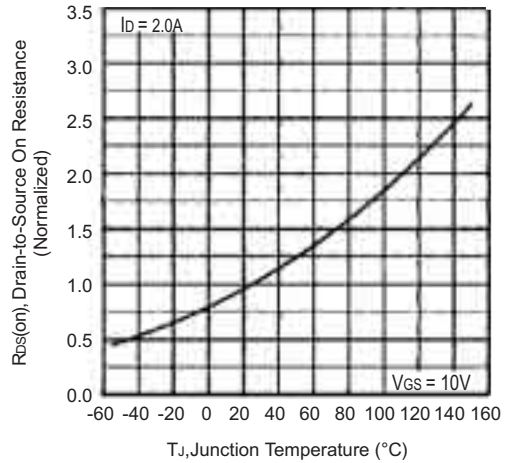




Figure 5. Typical Capacitance Vs. Drain-to-Source Voltage

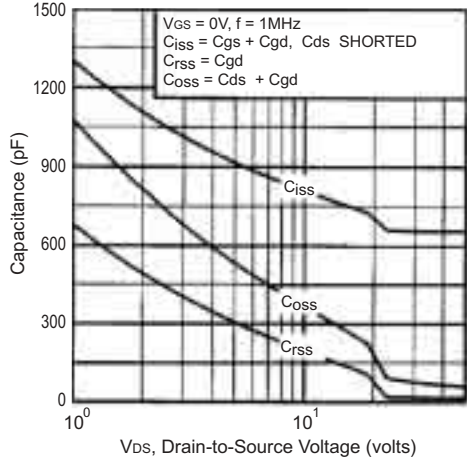


Figure 6. Typical Gate Charge Vs. Gate-to-Source Voltage

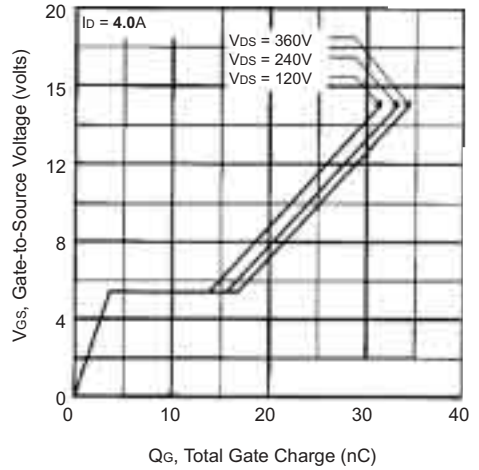


Figure 7. Typical Source-Drain Diode Forward Voltage

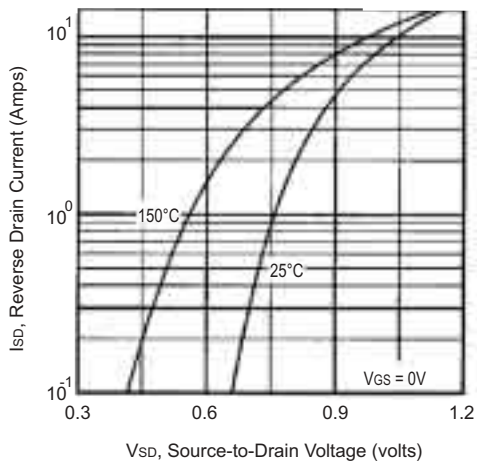
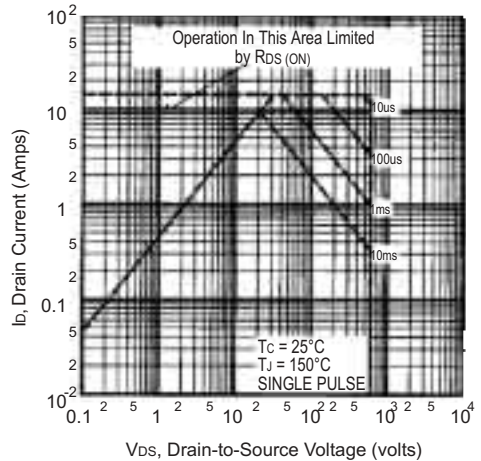
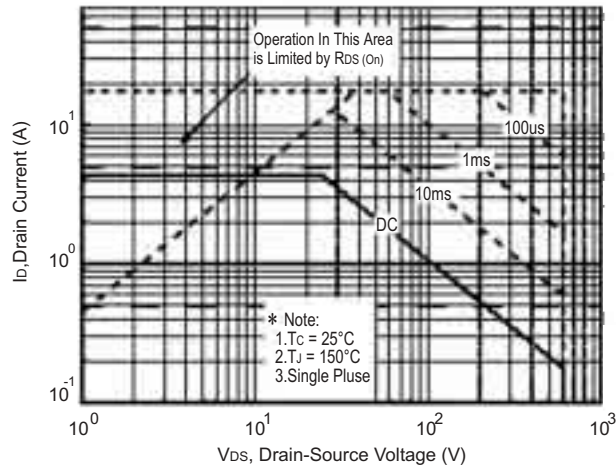


Figure 8. Maximum Safe Operating Area

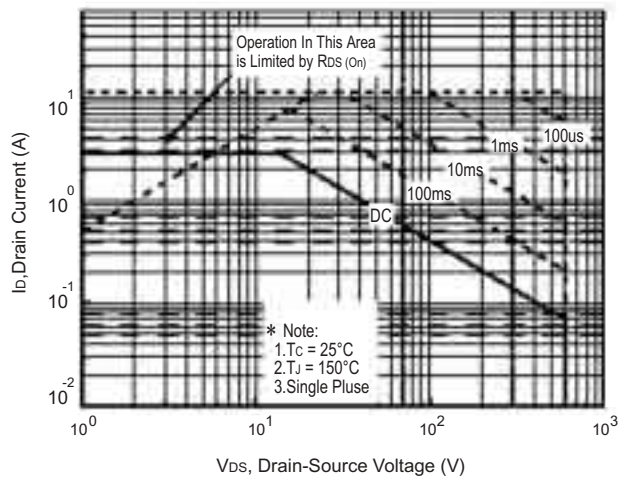




TO-220
Maximum Safe Operating Area



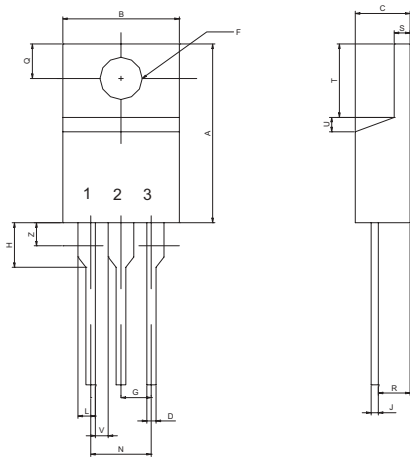
ITO-220
Maximum Safe Operating Area





Package Dimension

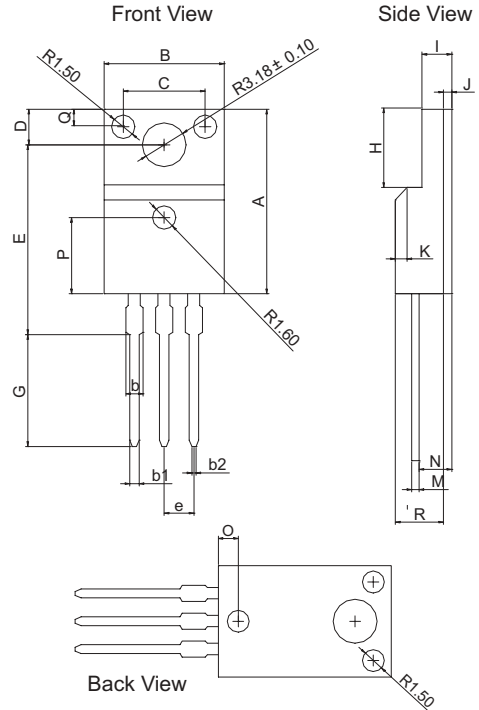
TO-220



PIN 1: GATE
 PIN 2: DRAIN
 PIN 3: SOURCE

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	14.48	----	15.75	0.570	----	0.620
B	9.66	----	10.28	0.380	----	0.405
C	4.07	----	4.82	0.160	----	0.190
D	0.64	----	0.88	0.025	----	0.035
F	3.61	----	3.73	0.142	----	0.147
G	2.42	----	2.66	0.095	----	0.105
H	2.80	----	3.93	0.110	----	0.155
J	0.46	----	0.64	0.018	----	0.025
K	12.70	----	14.27	0.500	----	0.562
L	1.15	----	1.52	0.045	----	0.060
N	4.83	----	5.33	0.190	----	0.210
Q	2.54	----	3.04	0.100	----	0.120
R	2.04	----	2.79	0.080	----	0.110
S	1.15	----	1.39	0.045	----	0.055
T	5.97	----	6.47	0.235	----	0.255
U	0.00	----	1.27	0.000	----	0.050
V	1.15	----	----	0.045	----	----
Z	----	----	2.04	----	----	0.080

ITO-220



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	15.67	----	16.07	0.617	----	0.633
B	9.96	----	10.36	0.392	----	0.408
C	----	7.00	----	----	0.275	----
D	3.20	----	3.40	0.126	----	0.134
E	15.60	----	16.00	0.614	----	0.630
G	9.45	----	10.05	0.372	----	0.396
H	6.48	----	6.88	0.255	----	0.279
I	2.34	----	2.74	0.092	----	0.108
J	----	0.70	----	----	0.028	----
K	----	1.00	----	----	0.039	----
M	0.45	----	0.60	0.018	----	0.024
N	2.56	----	2.96	0.101	----	0.117
O	----	1.80	----	----	0.071	----
P	----	6.50	----	----	0.256	----
Q	----	1.50	----	----	0.059	----
R	4.50	----	4.90	0.028	----	0.035
b	----	----	1.47	----	----	0.058
b1	0.70	----	0.90	0.028	----	0.035
b2	0.25	----	0.45	0.010	----	0.018
e	----	2.54	----	----	0.100	----